



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re application of : Confirmation No. 7492
Minoru TERANO et al. : Docket No. 2001-0466A
Serial No. 09/807,842 : Group Art Unit 1713
Filed July 9, 2001 : Examiner Fred M. Teskin

PROPYLENE/ETHYLENE BLOCK
COPOLYMER, BLUSHING-RESISTANT
TRANSPARENT POLYPROPYLENE RESIN
FOR MOLDING, ELASTOMER FOR
MOLDING, AND MOLDED
ARTICLE OBTAINED THEREFROM :

THE COMMISSIONER IS AUTHORIZED
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ACCOUNT NO. 23-0975.

RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Responsive to the Office Action of October 21, 2003, Applicants submit the following remarks in support of the patentability of the presently claimed invention over the disclosure of the reference relied upon by the Examiner in rejecting the claims. Further and favorable reconsideration is respectfully requested in view of these remarks.

Thus, the rejection of claims 25, 29, 30 and 31 under 35 U.S.C. §102(b) as being anticipated by Matthews et al. is respectfully traversed.

The Examiner takes the position that this reference discloses a thermoplastic elastomer which, in one embodiment, is a sequentially prepared polymer having (A) crystalline polypropylene segments of isotactic polypropylene and (B) amorphous segments of elastomeric ethylene-propylene, the (A) and (B) segments being partially block copolymerized to each other, the weight ratio of segments (A)

and (B) being within the range of 10:90 to 75:25 and the product being characterized by a melting point of at least 150°C.

Claim 25 subsection (a) of the instant application requires the polypropylene segments and poly(ethylene-co-propylene) segments to be linked chemically. In attempting to meet this claim limitation the Examiner relies upon column 1, lines 19-21 of the Matthews et al. reference, which states that “. . . segments (A) and (B) being partially blocked copolymerized to each other. . .”. However, the following remarks will demonstrate that the Matthews et al. reference actually teaches away from the use of chemical linking.

At the fourth full paragraph of column 1, in discussing the prior art, Matthews et al. describes several processes of polymerization. First, the reference teaches the introduction of “anchoring points” which tie the polymeric chains into giant macromolecules. When this is done by forming chemical bonds which link all the chains together one talks about “curing” or “crosslinking” the rubber. Matthews et al. further state that chemically crosslinking the rubber alters the rubber to a point where it can no longer be reprocessed, i.e. is no longer thermoplastic, and any scrap material has to be discarded. This inability of the rubber to remain thermoplastic conflicts with the object of Matthews et al., which is to produce a thermoplastic elastomer (column 1, lines 9-10). Therefore, Matthews et al. is describing the disadvantages of using chemical bonds in their polymerization processes. The reference continues by stating that the use of physical crosslinks rather than true chemical crosslinks can allow the reversal of the crosslinking effect by raising the temperature to a point which allows random motion. This portion of the reference demonstrates that Matthews et al. find the use of physical crosslinks, rather than chemical crosslinks, to be more advantageous.

In the next paragraph, the reference further discusses that one known kind of thermoplastic elastomer is a blend of polypropylene and ethylene-propylene. This thermoplastic elastomer is known as “TPO”. The thermoplastic elastomeric properties of TPO’s are thought to come about from interpenetrating networks of a continuous plastic phase (polypropylene) and a continuous rubber phase (ethylene-propylene). At column 2, lines 32-37, after discussing the fact that certain TPO’s have some chemical crosslinking introduced by partially curing while dynamically working the mixture (column 2, lines 21-23), Matthews et al. teach that one object of their invention is to provide a

thermoplastic elastomer having good properties without any necessity for a dynamic partial curing step. As discussed above, curing is considered a type of formation of chemical bonds. Therefore, Matthews et al. clearly state that a purpose of their invention is to provide a thermoplastic elastomer without the use of chemical bond formation, in view of which the teachings of Matthews et al. cannot be said to anticipate subsection (a) of claim 25, requiring the polypropylene segments and poly(ethylene-co-propylene) segments to be linked chemically. The Matthews et al. reference does not teach each of the limitations found in claim 25, and therefore cannot anticipate the invention.

Furthermore, referring to column 4, lines 9-45 of Matthews et al., which includes portions of the reference specifically cited by the Examiner, Matthews et al. state that "It is believed that . . . , one species being a living propylene polymer . . . , while an other species has a relatively shorter lived end"

However, the ratio of both species is not described. In TABLE I and II of the reference in which the reaction conditions of Example 1-13 are shown, the polymerization is conducted in an autoclave reactor, that is, a batch reactor, and the polypropylene homopolymer portion is polymerized in a polymerization time of 15-20 minutes, and the ethylene-propylene copolymer portion is polymerized in a polymerization time of 25-40 minutes. These polymerization times are very long, therefore, the polypropylene homopolymer portion is essentially not chemically bonded, to the ethylene-propylene copolymer portion. Matthews et al.'s polymer is, practically speaking, a blended composition of a polypropylene homopolymer portion and an ethylene-propylene copolymer portion micro-dispersed in the polypropylene homopolymer portion.

This fact is well-known by the artisan, as apparent from the references discussed in the background art beginning on page 2 of the present application, where mention is made of Japanese Patent Application Laid-Open Nos. 8-92338 and 9-87343 which disclose a polypropylene -b- poly(ethylene-co-propylene) comprising a polypropylene segment and a poly(ethylene-co-propylene) segment, with the two types of segments being chemically linked, and a method of producing the same. However, such polymers have a low weight-average molecular weight and are not suitable for producing general-purpose molded articles.

Japanese Patent Application Laid-Open No. 9-241334 discloses a block copolymer having an intrinsic viscosity $[\eta]$ of 0.8, a block copolymer segment content of 34 wt. %, and an ethylene content of the block copolymer segment of 40wt. %. However, the polymer disclosed therein also has a weight-average molecular weight of as low as approximately 80,000, and thus, is not suitable for producing general-purpose molded articles.

Japanese Patent Application Laid-Open No. 9-241334 corresponds to USP 6,211,300 (Terano et al.) which the Examiner has already cited in the present application. During examination of USP 6,211,300 the Matthews et al. reference (USP 4,491,652) was cited. Applicants note that USP 6,211,300 claims a polymer, which like the polymer of the present invention comprises a real block copolymer, and issuance of USP 6,211,300 establishes that the invention claimed therein was considered to be patentable over the Matthews et al. reference, which as noted above, does not disclose a real block copolymer. For the same reason, the present invention is considered to be patentable over Matthews et al.

Furthermore, Applicants note that the polymer of Matthews et al. is a homologue of the following polymer "l" of comparative experiment I-4 and the following polymer "m" of comparative experiment I-5 on page 50 of the present application:

(l) conventional propylene-ethylene block copolymer prepared in the following manner: polypropylene segments were firstly prepared through polymerization, and the polypropylene segments (86 wt%) were polymerized with copolymer segments (14 wt%).

(m) conventional propylene-ethylene block copolymer prepared in the following manner: polypropylene segments were firstly prepared through polymerization, and the polypropylene segments (81 wt%) were polymerized with copolymer segments (19 wt%).

Accordingly, Applicants take the position that the polymer of the Matthews et al. reference is clearly different from the polymer of the present invention, since in the present invention the polypropylene segments and poly(ethylene-co-propylene) segments, are linked chemically as required by claim 25, which is neither disclosed in nor suggested by the Matthews et al. reference.

The rejection of claims 26-28 under 35 U.S.C. §102(b) or 35 U.S.C. §103(a) based on Matthews et al. is respectfully traversed.

The comments set forth above concerning Matthews et al. are equally applicable to this rejection. Since claims 26-28 are directly or indirectly dependent on claim 25, the subject matter of claims 26-28 is patentable over Matthews et al. for the same reasons that the subject matter of claim 25 is patentable over this reference.

Therefore, in view of the above remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

Minoru TERANO et al.

By:

A handwritten signature in black ink, appearing to read "Michael R. Davis", is written over a horizontal line.

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